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Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

No. 21

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PRESS REPORTS ON FRG NUCLEAR AGREEMENT, SAFEGUARDS

Safeguards Assurances

Buenos Aires LA NACION in Spanish 16 Nov 79 p 8

[Text] The Argentine Government has approved the bid made by the German firm Kraftwerk to supply a pressurized water reactor to complete the Argentine Nuclear Plan, to be controlled by the National Atomic Energy Commission [CNEA], which will be given the capacity of a state company for the sake of greater facility in maneuvering and performing its task.

The decision was made after an assessment of the advantages and disadvantages that the acceptance of the German-Swiss bid offered in comparison with the one made by Canada and Italy, with whose participation the Rio III plant is being executed. The difficulties posed by the Canadian Government at a certain stage in the relations with the nuclear company of that origin, understandably, had to be considered in the position assumed at present. The requirements for safeguards and the signing of the nuclear non-proliferation treaty could not be demanded nor agreed to, transcending the stipulation regarding independence that Argentina could accept. For the peace of mind of those who have an exaggerated fear of the construction of plants associated with atomic fission processes, and regardless of how widely publicized the fact has been, it befits us to recall that, since Argentina is a member of the International Atomic Energy Agency, with headquarters in Vienna, which is subordinate to the United Nations, we are subject to a system of safeguards. The latter, established by the IAEA, are sufficient protection against the dangers of this type of energy generation, if they do in fact exist.

To go any further would entail unacceptable pressure on our country, which has unequivocally stated that it feels bound by the requirements of the international agency. It would be equally brazen and unfair to ascribe to Argentina the intention of using its installations and technology, which have been so highly esteemed for their quality and the proven operating efficiency of the Atucha plant, for military purposes. The same holds true for the other facilities within the purview of the CNEA which have also gained widespread recognition on the continent and beyond it, for their achievements in the field. The Argentine contribution to nuclear medicine is of great importance, both quantitatively and qualitatively.

The report that appeared in the press as one originating in the Federal Republic of Germany, which announced that the Bonn government was revising the aforementioned agreement signed with Kraftwerk, in order to require safeguards before authorizing the contracting firm to conclude the agreement, received a warped interpretation, most likely due to the lack of clarity in the news account. The sizable interests in motion concerning nuclear projects usually see to the necessary objectivity in reports relating to them. On the other hand, the conspiring political extremists are up to their old tricks as soon as they perceive an opportunity to harm our country.

Subsequently, the situation came closer to the truth, and the statements made by board members of the German firm have announced that these are normal proceedings called for as part of the negotiations. One cannot sensibly think otherwise, unless it is assumed that groundless and illegitimate pressure is being exerted on the German Government. Obviously, the bid could not have been made without first considering all the requirements which the German authorities and the laws in effect, binding "ergo omnes" [therefore on all], would be likely to invoke. The position assumed by the Argentine Government in forming and supporting its nuclear policy is also widely known. So, the spirit of good faith essential to any contract, and particularly those of the type which has prompted the comment, cannot tolerate being thwarted by the advent of unforeseen and unforeseeable obstacles that are not in keeping with the terms of the agreement. In reiterating the fact that the safeguards exist, and will be upheld to the extent that the valid commitments require, Argentina has given its word. In fact, the news coming from our embassy in Bonn has been reassuring as well. Hence, it is to be expected that the implementation of the terms of the contract will begin as soon as possible.

Probability of Accord Approval

Buenos Aires LA NACION in Spanish 14 Nov 79 p 6

[Text] It is considered highly unlikely that the government of the Federal Republic of Germany will make unanticipated objections to the sale of a reactor to be sent to the Atucha II nuclear powerplant. Following the circulation of conflicting reports, which were first repudiated by the chairman of the National Atomic Energy Commission, Rear Adm Carlos Castro Madero, and later rejected by the Argentine ambassador to the Federal Republic of Germany, Dr Raul Guyer, it was assumed that the German Government informed the Nuclear Council yesterday about the negotiations with Buenos Aires.

According to information and comments made enthusiastically by government and scientific circles in this capital, it is regarded as almost certain that the sale will be approved before the end of the year.

In Bonn

Bonn--Experts in this capital remarked yesterday that the German Government may give its approval before the end of this year for the sale of a natural uranium reactor to Argentina.

The sale of this reactor to Argentina was the most important topic discussed at the meeting held by the German Government's Nuclear Council.

Although no official report was issued, it is believed that the German Government notified the Nuclear Council of the present status of the government negotiations between Bonn and Buenos Aires on the subject of the sale of the reactor and the controls for nuclear safety.

Controls

Bonn, 13 November (AFP)--Sources who are specialists have stated that, before the end of the year, the German Government will give its permission for the firm Kraftwerk Union to deliver a non-enriched uranium reactor to Argentina.

This report was leaked at a meeting held in Bonn yesterday by the Nuclear Council, a consulting agency formed in 1977 by the foreign minister of the FRG, Helmut Schmidt, consisting of representatives of the government and the trade unions, and scientific experts.

According to the sources, the German Government wants the Argentines to accept stricter safety controls than those required by the International Atomic Energy Organization [OIEA]. The sources gave a reminder that Argentina has not signed the nuclear non-proliferation treaty.

However, the specialist sources are of the opinion that Argentina will accept the terms of the German Government, and that the latter will therefore make a favorable decision during the next few weeks.

Reactor Sale Delay Foreseen

Buenos Aires LA PRENSA in Spanish 16 Nov 79 p 4

[Text] Bonn, 15 November (EFE)--The government of the Federal Republic of Germany has not yet granted the necessary permission for the exporting of a nuclear powerplant to Argentina.

An official German spokesman told the EFE agency today that the granting of the permission will depend on the results of the official discussion between Bonn and Buenos Aires.

A few days ago, government sources stated that the German Government might grant that permission before the end of this year, a report which was not confirmed by the spokesman.

The delay on the part of the Germans is apparently due to Argentina's unwillingness to accept the international controls on the operation of the heavy water reactor.

Last October, the Argentine Government decided in favor of the German bid in the international bidding on the Atucha II project.

This nuclear reactor, fed with natural uranium, was ordered from the German company Kraftwerk Union AG, a branch of the international Siemens firm.

Talks With Other Governments

A spokesman from the Federal Republic's Ministry of Economy told EFE today that, in addition to the official German-Argentine dialog, the Bonn government is in contact with Canada, the United States and Switzerland on this subject.

The results of the bidding in favor of the German company apparently caused tension on the official level between the governments of Canada and the Federal Republic of Germany, inasmuch as the German offer did not demand so many guarantees as that of Canada.

Bonn's dialog with the United States is based on Washington's position against supplying nuclear technology to countries such as Argentina, which have not signed the atomic non-proliferation treaty.

Mission to Buenos Aires

Press sources noted that, in an apparent attempt to bring the operation to a successful conclusion, a delegation from the German Ministry of Foreign Affairs will visit Buenos Aires soon.

However, despite the fact that the concessionary firm for Atucha II views the future with "justified optimism," official circles in Bonn have not concealed a certain amount of concern over the results of the mission.

Those circles are aware that the Argentine authorities have thus far refused to accept international nuclear controls, invoking principles of national sovereignty.

In this connection, Argentine diplomatic sources in this capital referred to the government's position in the matter, making it clear that the authorities in their country do not intend to change their attitude.

2909

CSO: 5100

FIRST NUCLEAR PLANT DECISION TO BE TAKEN IN 3 YEARS

Montevideo LA MANANA in Spanish 9 Oct 79 p 4

[Text] "Within a period of 3 years Uruguay will have to make a decision whether to start construction on a nuclear-electric plant," our country's minister of industry and energy stated; while Sigvard Eklund, the director general of the International Atomic Energy Agency, who is visiting Uruguay, emphasized that at present atomic energy is the only sure way to replace the energy generated by petroleum.

Chemical Engineer Luis Meyer also noted the importance which the construction of an energy-producing nuclear plant would have for the country, after an interview with the high official of the international agency, who is considered one of the world experts on the subject.

Later he indicated that after the decision was made on construction of a nuclear electric plant, a decision which should not be delayed more than 3 years, feasibility studies would have to be made to determine the costs and profitability of production of energy by this system.

Studies relating to its possible construction are well advanced, but it is premature to go ahead on a decision.

The construction of a nuclear plant for the production of energy is included in extensive studies of different sources to replace petroleum.

Miniturbines

Luis Meyer also stated that he was carrying out a broad analysis of the country's water resources with UTE [General Administration of State Electric Power and Telephones] authorities, and mentioned that during his recent visit to Vienna he evaluated the functioning of miniturbines, usable on any watercourse.

"We think that this would be a good solution for the obtaining of better water resources," the minister of industry and energy pointed out.

Interview with Eklund

Luis Meyer had an interview in the evening with the director General of the International Atomic Energy Agency, Mr Sigvard Eklund, and declared how important the presence of the distinguished visitor was for the country, and for Uruguay's various projects, especially those relating to atomic energy.

As has been reported, the visiting expert was invited by the nation's government with the purpose of holding a series of talks relating to advice which the International Atomic Energy Agency could offer on the subject.

Opinion of the Visitor

Mr Sigvard Eklund was asked after the interview with the minister of industry and energy about Uruguay's potential in nuclear energy.

He explained that if our country decides on construction of a nuclear plant for the production of energy, a period of between 8 and 10 years would be necessary for installation. He added that before going ahead on construction it would be essential to possess all the necessary information on the subject as well as personnel specially trained for the tasks they would undertake.

Commenting on the world importance of nuclear-electrical energy, he stated that it is the only way to produce energy on a large scale.

8131

CSO: 5100

MOROCCO

URANIUM EXTRACTION, NUCLEAR ENERGY DISCUSSED

Casablanca LA VIE ECONOMIQUE in French 21 Sep 79 pp 1, 3

[Article: "Uranium, a New National Wealth"]

[Text] The International Uranium Institute has just held an international conference in London. During the meeting, a French specialist, Marcel Bergeret, from the Pechiney-Ugine Kuhlmann Company, stressed the idea that since the price of phosphates has quadrupled during the last 5 years the extraction of this metal from nonconventional sources was now possible. This is especially true of phosphates with obviously superior advantages.

One of the main reasons for this is that uranium is becoming a by-product of the transformation of ore into phosphoric acid. Such a process is possible only with significant amounts capable of producing at least 150,000 tons of phosphoric acid a year, according to Bergeret.

The amounts already obtained or in process at Safi are quite a bit above this level: 165,000 tons of P_2O_5 at Morocco Chemicals; 495,000 tons at Morocco Phosphorus I and also 495,000 tons at Morocco Phosphorus II.

Moreover, Bergeret stressed the fact that a plant for the extraction of uranium can be built in 2 years, whereas it takes 10 years to establish a productive mine.

Also, Bergeret noted that 55 percent of Moroccan phosphates contain uranium. This is the highest concentration in the world. The total uranium reserves in phosphates for the world are estimated at 15 million tons. Morocco must therefore possess more than three-fourths.

While this meeting was in progress in London, our colleagues at AFRIQUE INDUSTRIE published an interview with Moussa Saadi on this same subject. The minister presented some new facts.

Saadi said: "It is easier to extract the uranium from our phosphates than from phosphates found in other countries. Newly-developed processes permit extraction of 70 to 90 percent of the uranium whereas elsewhere only 20 to 40 percent can be extracted."

Here are Saadi's statements: "The ore is extracted directly from phosphoric acid (which is found in a fairly pure form) and factories will therefore be built next to the Safi and Jorf Lasfar complexes which are the most significant in the world."

"The installation of the first plant is planned for Safi. It will have a capacity of 450 to 600 tons per year of uranium oxide. We are awaiting the results of the first demonstration factories to make a decision on what process we will use because we cannot bear the expense of experimenting."

"Uranium is not useful in itself. What we obtain will therefore be sold and processed in an enrichment plant and then returned to us for use in our own nuclear centers after 1990."

Recourse to nuclear power is necessary: "The country's consumption of primary energy in 1978 was 4.22 million TEP (tons equivalent to petroleum) composed as follows:

Hydroelectricity	8.72 percent
Coal	10.88 percent
Petroleum products	78.94 percent
Natural gas	1.47 percent."

"Our own country's resources satisfied 21 percent of this consumption."

"Thus Morocco imported 79 percent of its energy needs from foreign sources."

"If we calculate future energy consumption based on an 8 percent increase, it will become 5 million TEP (4.5 in petroleum) in 1980 and about 24 million TEP (18 in petroleum) in the year 2000."

"Disregarding coal, hydroelectricity and nuclear energy, the entire budget for Morocco would be needed to import the amount of petroleum needed."

"Therefore, we must invest in three areas: shale-oil, which will be available for use in 1985 and might represent about 40 percent of the total energy supplies for the year 2000; hydroelectricity, which should provide 10 to 20 percent; nuclear power, which should provide 20 percent; the remainder should be in petroleum with supplementary amounts of solar and geothermal energy."

"To this end, large investments are necessary but profitable in the long run. However, there will be some difficulties until 1990, which will intensify in 1985. A nuclear center is planned for 1990. A site has not been chosen. Several criteria are necessary. The area must not be prone to seismic activity and it must be close to water (a river or an ocean) and close to regions where the power will be used. The area from Casablanca to Kenitra is again a possibility. However, in an effort at decentralization it might be built further away, perhaps to the north (but that is an area of seismic activity) or perhaps the south."

"Security problems are not in question as long as there are only one, two or three plants. Furthermore, in 10 years the facts may be quite different."

"For the immediate future we are making preparations and have already made contact with an American company, "General Atomic," to acquire an experimental nuclear reactor which will be installed in Rabat University in order to train technicians."

Saadi stated that petroleum is a risky thing. He said that we want to be realistic and depend only on what is sure. "If petroleum comes in addition, we will welcome it."

9161

CSO: 5100

SOUTH AFRICA

MANUFACTURE, EXPLOSION OF ATOMIC BOMB DENIED

Johannesburg DIE VADERLAND in Afrikaans 29 Oct 79 p 5

[Interview with former Director of Institute for Strategic Studies Prof Mike Louw; date and place not given]

[Text] South Africa has never had an atomic bomb, cannot build one and could not have exploded one in the atmosphere thousands of miles far out at sea. The U.S. assertion that South Africa has conducted a test explosion is ridiculous.

That was what the prominent strategist, Professor Mike Louw, former director of the Institute for Strategic Studies of the University of Pretoria, said in an exclusive interview with DIE VADERLAND.

Professor Louw stated that there are five main reasons why South Africa does not have an atomic bomb and could not have exploded one over the sea as the Americans are now asserting. This is not a practical undertaking for South Africa.

The five reasons are as follows:

The Political Factor: Because South Africa's number one priority in its foreign policy is to make friends in Africa and in the rest of the world, it will not develop an atomic bomb. Such a bomb would wreck this policy entirely. No country in Africa would want to be friends with us if we had a mass destruction weapon. For this reason we will not develop one.

Delivery

A Delivery System: South Africa does not have any of the three methods of firing an atomic bomb at a target area effectively. First of all we do not have the long-range bombers which would be necessary for using this obsolete and unpractical bombing technique. Lacking are also the other two methods of delivering such a bomb by means of a missile from land or sea. South Africa does not have long-range missiles and does not yet have the technology for developing them. We do not even have the required radar system which is necessary for guiding such a missile.

Target Areas: South Africa does not have target areas for which an atomic bomb would be necessary and practicable. It would be senseless to use an atomic bomb in a preemptive attack and to unleash it against a developing country in Africa. Moreover, there is not a single black country in all of Africa which could be technically regarded as an enemy worth attacking with an atomic bomb. The bomb itself would be too expensive for that.

Materiel Shortage: It is highly improbable that South Africa has the materiel necessary for the manufacture of an atomic bomb. A lot of enriched uranium and a large reactor are necessary for manufacturing and storing the plutonium necessary for an atomic bomb. The Atomic Power Board's nuclear reactor is a research reactor which is hopelessly ineffective and too small for manufacturing a sufficient amount of uranium for weapons purposes and the enrichment facilities of the Atomic Power Board represent only a pilot unit which moreover cannot produce the highly enriched uranium. In addition the enrichment percentage is only in the neighborhood of 5 to 10 percent while for weapons purposes 90 percent is necessary.

Testing Possibilities: It is absolutely stupid to explode a test bomb in the atmosphere thousands of kilometers far from land over the sea where the entire reaction of the bomb could not be properly monitored with instruments. No one has ever carried out a test explosion in this manner. This has always been done on land. Moreover, South Africa does not have open ground which is extensive enough for carrying out a test explosion in secrecy on land.

"Because of these five reasons I say that the Americans' assertion is senseless. Nobody would proceed to conduct such a trial explosion, which costs millions, just to see if the thing goes off. Dozens of fine and sophisticated observations are necessary in order to justify the explosion.

"Over and above this, South Africa is a signer of the treaty which forbids nuclear testings through explosions in the atmosphere even though our country has not yet signed the regular nuclear nonproliferation treaty.

"I do not know who or what is responsible for the explosion which the Americans claim to have observed, however, I am convinced that it was not South Africa," Professor Louw stated.

7964
CSO: 5100

SOUTH AFRICA

FOREIGN MINISTER CRITICIZES AMERICANS FOR THEIR NERVOUSNESS OVER ALLEGED A-TEST

Capetown DIE BURGER in Afrikaans 27 Oct 79 pp 1, 9

[Interview with Pik Botha on ABC-TV; date not given]

[Text] Pretoria--In an interview with an American television network Pik Botha, the South African minister of foreign affairs said that South Africa does carry out atomic tests, but he did not spell out whether these are atomic bomb explosions or whether these are tests related to uranium enrichment.

In the course of the interview with ABC-TV Minister Botha took the stand that he knew nothing about atomic bomb tests by South Africa as asserted, but he never categorically denied that perhaps such tests are being conducted.

As a result of the repeatedly provoking questions put to him by the ABC-TV reporter Minister Botha told him: "Look, I represent a foreign country. I am not on trial here; I am not a defendant in any particular case and I have given you my opinion as the foreign minister of South Africa.

Proud

The reporter mentioned to Mr Botha that he (Mr Botha) had accused the State Department people of acting like cowboys.

Minister Botha replied: "No, not the State Department, but certain elements in the United States. Certain American elements are evidencing nervousness and this is not doing any good to the United States. This sort of thing is like a cowboy who doesn't know how to handle a gun and moreover has forgotten how to act with pride. That is unfortunate, because the United States is a great and powerful country and an orderly country."

"America should rediscover its own strength, morally, politically, economically and militarily. America has a world role to play; it is the leader of the Western World. In this world America alone stands between freedom and slavery. We would like to see America get rid of its self-imposed belief in the unavoidability of its own defeat. It has the power; it is a free land that stands for freedom. Use it, apply it."

Violated

In answer to the ABC-TV reporter's question as to whether the fact that a nuclear explosion might have taken place is not reason enough to be nervous, Minister Botha stated that he thinks that the facts should first of all be ascertained before one tries to determine the origin of an alleged event.

Minister Botha said: "Of course we are conducting tests. We have the capability of enriching uranium. We have our own program, and what is more, it is very regrettable that America has violated an existing agreement in accordance to which the United States must provide the fuel for the Safari project...a scientific project.

"In other words, in view of the fact that the United States has violated the existing agreement, it has encouraged my country to get its own enrichment program going, because we too, want power and development in this country. America could have been a partner with full guarantees. That's how matters stand. Up until now we still have not received any guarantees. You have violated an existing agreement between two countries."

Minister Botha went on to say that he wants to advise America to stop giving evidence of its nervousness. "Accept the role of an anti-Marxist country. What you are doing is frightening your friends and giving comfort to your enemy."

When the reporter stated that Minister Botha is alleged to have stated that South Africa "wants to have the capability as well as the nuclear fuel," Minister Botha denied that he ever said that. "I say we have it; we have our own enrichment program."

When asked by the reporter if he would categorically state that South Africa has no military ambitions with nuclear power, the minister replied that South Africa is interested in the peaceful application of nuclear power as shown by the country's efforts in building the Koeberg power plant in Capetown and the experiments in preserving nutrients and fruits.

7694
CSO: 5100

FURTHER PRESS COMMENT ON SUSPECTED NUCLEAR TEST

'HOOFSTAD' Editorial

Pretoria SOUTH AFRICAN DIGEST in English 2 Nov 79 p 22

[Text]

Yankees play dirty

The ghost called up by America's nuclear test tale has by no means been laid and still holds great danger for South Africa's policy of rapprochement in Southern Africa.

America's scant evidence that such an explosion took place and its own admission that the explosion — if indeed there was one — could have taken place anywhere in the Southern Hemisphere in the area bordered by the Atlantic and Indian oceans and Antarctica, makes it no easier for South Africa.

One is inclined to say there's no smoke without a fire. So, the reasoning goes, South Africa is a major producer of uranium, has its own enrichment process, has the necessary know-how to manufacture a nuclear bomb, plus the industrial structure required for such a step, and, last, but by no means least, is in sufficient military danger to require a nuclear weapon. The sum total is that many countries, even friendly ones, are suspicious.

The fact is, of course, that the US knows all too well there's no truth in its allegations. But it suits the mighty giant of the West to hurl these insinuations at South Africa.

First, South Africa's enrichment process is a threat to America's monopoly in the West and, second, that country wants to force South Africa in this way to sign the nuclear proliferation treaty and so exclude it as a future nuclear nation.

In addition to being the policeman of the West, America is still a competitor on the economic front and does not hesitate to put a spoke in the wheel of its competitor in the West by means of blackmail, threats and dubious business practices.

Just take a look at how hard Uncle Sam tried to deal the gold price a blow by attempting to flood the market.

This is the case with its supposed concern about a South African nuclear bomb test. It's just a pity that this could bedevil South Africa's future relations with states in Southern Africa and in this way put a spoke in the wheel of the Prime Minister, Mr P W Botha's envisaged constellation of states. That would be regrettable.

Pretoria

A — October 29

'DIE VOLKSBLAD' Comment

Pretoria SOUTH AFRICAN DIGEST in English 2 Nov 79 p 22

[Text] **Atom bomb spectre again**

Somewhere in a geographical area covering about a tenth of the earth somebody sees something — a satellite, perhaps, one that exploded like Skylab, a tremendous flash of lightning perhaps, or maybe some or other weather phenomenon that even appeared on the SABC's synoptic chart. In the US this finding means one thing only — South Africa has carried out a nuclear explosion.

The Republic is not given the benefit of the doubt, even though the US administration admits that what it saw with its satellite could have been anything — from a cloud in front of the sun to a vodka bottle that could have broken on a Russian fishing vessel in the Indian Ocean. It is possible that the satellite merely monitored a natural phenomenon, Washington says.

To make sure, the US has consulted its other sources and it would be no surprise if Russia provides corroborating evidence, as was the case when the atom spectre haunted the Kalahari. At that time it was said that Russian satellites were actually better geared to monitoring the Southern Hemisphere.

That the Kalahari was combed in search of the alleged testing ground and that the secret installations could have been anything from Upington airport to a farm outhouse in the desert, by no means neutralised the impact of the initial allegations.

Since then the Republic has repeatedly given the assurance that it is using its nuclear potential for peaceful purposes and for the past two years there has been more fruitful co-operation between Pretoria and Washington on nuclear matters. That someone has now interpreted two lights in the dark as the eyes of a lion, gives rise to the question of whether political motives are not rearing their heads — like the previous round of fables when the US was engaged in a vicious attack on the Republic. Why now condemn South Africa for something that — if there was in fact an explosion at all — could as well have been the responsibility of a dozen or more countries?

Until the US has sorted out its own mirages and hallucinations, a big question mark must hang over the strategy of its nuclear arms diplomacy.

Bloemfontein

A — October 26

'THE NATAL MERCURY' Comment

Pretoria SOUTH AFRICAN DIGEST in English 2 Nov 79 p 23

[Text] **Protesting too much**

American reports suggesting that South Africa may have exploded a nuclear bomb in a vaguely defined area of the southern hemisphere raise four main possibilities: (a) South Africa has exploded a bomb. (b) Someone else has exploded a bomb. (c) The Americans are mistaken. (d) A false report has been leaked for some ulterior motive.

The first possibility is considered quite feasible by experts but is improbable. In view of the swift and strong denials of

the report by both the Foreign Minister, Mr Pik Botha, and the president of the Atomic Energy Board, Dr J W L de Villiers, attention turns to the remaining possibilities. Of these (b) and (c) will, if true, presumably be verified sooner or later. The fourth possibility (d) takes us into the realm of speculation, but it is legitimate speculation when one considers the extraordinary and continuing international suspicion concerning South Africa's nuclear capability.

These include claims in 1977 by Russia, the United States, France and others that South Africa was about to

test a nuclear device in the Kalahan, alleged collusion with Israel, elaborate propaganda about a supposed "nuclear axis", and the United States Embassy "spy plane" incident last April. It has even been seriously suggested that Sasol II is a cover for an atomic bomb plant. So there is no lack of mischief-makers in this fertile field.

The ways of international diplomacy and politicking are scarcely less devious. With the SALT II treaty awaiting US Senate approval, one thinks for example of President Carter's warning some months ago that South Africa could turn to nuclear weapons if the Senate failed to ratify the treaty.

On the other hand the apparent vagueness of American intelligence reports on this "explosion" is likely to raise further doubts about America's ability to monitor the SALT agreement adequately.

South Africa's sensitivity on the issue is reflected in repeated assertions that she is interested only in the peaceful uses of atomic energy. Having refused to sign the nuclear non-proliferation treaty, South Africa has been denied US supplies of enriched uranium and may now be dependent on her own costly enrichment process to fuel the Koeberg reactor and carry on with her nuclear programme.

If, however, South Africa is going to be ostracised as an international "no-hoper", nobody should be surprised if she decides to develop her undoubted nuclear capability in defence of her national interests and survival. The time may soon come when it no longer pays to bend over backwards to try to convince the rest of the world that we do not have the bomb. After all, much of its deterrent effect lies simply in the belief of one's enemies that one possesses it.

Durban

E — October 27

CSO: 5100

URANIUM RESERVES IN RANDFONTEIN SECTION OVER-ESTIMATED

Johannesburg THE CITIZEN in English 3 Nov 79 p 14

[Article by David Bamber]

[Excerpts]

THE tonnages and grade estimates of the ore remaining in Johannesburg Consolidated Investment's Randfontein Estates Gold Mining Randfontein Section are overvalued and the economic potential of the area appears, at best, to be marginal.

The startling announcement that a significant discrepancy exists between the sampling results, on which the evaluation of the Randfontein Section was based, and those based on current development and stoping sampling was made yesterday along with the release of JCI's annual report.

The company says the conclusion has been drawn after receiving sampling results from the 18 and 24 levels of the Randfontein Section — levels which have recently been re-equipped and re-entered following dewatering.

The company rates the re-evaluation of the potential as not definitive and is still underway, but adds sufficient evidence exists to suggest that many of the factors drawn from Randfontein's operations between 1955 and 1964, such as stope and block values and plant recovery, were either wrong or misleading.

The company believes the Cocks and Millais plants will be able to meet the company's contractual uranium commitments eventually.

It concedes the loss of a major part of the anticipated uranium production from the Randfontein Section is a serious setback but believes that, should a shortfall occur in respect of its uranium contract, alternative arrangements can be made to meet this commitment.

CSO: 5100

INTERNATIONAL AFFAIRS

CANADA, FRG DISPUTE SAFETY STANDARDS ON REACTOR SALE TO ARGENTINA

Hamburg DER SPIEGEL in German 19 Nov 79 pp 45--49

[Article: "The Fight About the Water Plant--Canada Charges That the Germans Broke Security Agreements in the Sale of a Nuclear Reactor to South America"]

[Text] Chancellor Helmut Schmidt had urgently warned the managers of the nuclear industry that "international competition" on no account must cause "the security factors to be disregarded."

Half a year after this warning by the chancellor, voiced at the European Nuclear Conference in May, it seems as if the managers did not listen properly to their head of government.

With Bonn Minister for Economics Otto Graf Lambsdorff lending a helping hand in the bidding, Kraftwerk Union AG [KWU], a Siemens subsidiary, had received a contract for building an atomic reactor from the Argentine junta, and now the circumstances of the celebrated business coup make it appear that the chancellor's remark was but a hollow phrase.

Instead the rulers in Bonn are faced with the charge that they have shamelessly violated international agreements and knowingly deviated from security standards to take advantage of export opportunities.

Plaintiff in the current proceedings is the government of NATO partner Canada, while our friends in the United States are coplaintiffs. Both charge the Germans with helping out the military dictatorship in Argentina with atomic knowledge all too readily and without adequate controls.

What is bound to be especially embarrassing for the people in Bonn is the fact that for the second time German atomic deals are causing the displeasure of their friends across the Atlantic. Already in 1975, Brazil had been promised a complete atomic cycle. Just as then, the people in charge in Washington now were afraid that without controls the recipient might be

able to convert the technology supplied to him for military use.

Thus U.S. President Jimmy Carter, who has always been opposed to nuclear exports, late in October sent his special ambassador Gerald Smith across the Atlantic to express to the people in Bonn the concern of the atomic superpower.

The Canadians showed less restraint in making their displeasure felt. After all, they would have liked to get the contract themselves.

Secretary of State for External Affairs Flora MacDonald lodged a complaint with Hans-Dietrich Genscher during a UN meeting. And when Genscher saw fit to cancel a planned visit to Ottawa altogether, she additionally notified her counterpart of her anger in writing.

The Canadian attacks apparently caused considerable discomfiture at the Foreign Ministry in Bonn. A trip by Minister of State Hildegard Hamm-Bruecher was called off "because of a head cold," according to a ministry official. Unimpressed by the illness, the Canadians announced a "nadir in relations" between Bonn and Ottawa.

In mid-October Mrs MacDonald even refused to receive Berlin Mayor Dietrich Stobbe, who was traveling in his capacity of head of the Bundesrat [FRG upper house]. Instead Premier Joe Clark asked to see Stobbe and protested to him about the German business action, asking him to pass the protest to the chancellor.

The dispute between the Germans and the Canadians had begun when the Argentine military expressed the wish for a third nuclear reactor for their country. For this purpose, the Argentines were planning a plant for producing heavy water, needed for power plants with fuel rods from natural uranium.

The military asked for bids from the suppliers of the first two reactors --a Canadian-Italian consortium, which for years has been trying to complete a power plant in Cordoba, and the German KWU, whose reactor Atucha I has been supplying power since 1974.

At first in full accord, the bidders agreed to apply the same security standards.

The Argentines were to receive the heavy water plant only if, as part of the deal, they pledged to have their entire atomic laboratories and nuclear installations checked by the International Atomic Energy Agency in Vienna.

For this installation would give Argentina a complete atomic cycle--from uranium to the bomb material of plutonium. Having objected to such inspections to date, Argentina also failed to sign the nuclear nonproliferation treaty.

The planned sales combination of reactor and heavy water plant (and thus the stricter controls) was, however, avoided.

On 2 October the head of the Argentine atomic program, Admiral Castro Madero, made a public announcement on who had won in the bidding. There were two victors. The German KWU is to build the reactor, and the Swiss firm Sulzer the water plant.

It soon became apparent what the Swiss were good for. The German-Canadian security agreement, the Swiss said, was really none of their business. Their water plant was to be checked, but that was all: the existing Argentine atomic research and testing installations were unaffected.

The Canadians now rightly suspect that a successful chess move by the South Americans forms the basis of the contract with the Swiss firm of Sulzer. Moreover, they have an idea that the Germans also had their finger in the pie.

For the Germans were particularly keen only on the reactor contract. Their interest in supplying the water plant, on the other hand--to be furnished by Uhde GmbH [Ltd] of Dortmund--was limited.

The Canadian assumption is that the German diplomats negotiated with Ottawa about joint control measures only until it became certain that the Swiss, not involved in them, would get the contract, and that the Germans had intended to eliminate the Canadians from the start.

And there is something else that the Canadians find peculiar: at 1.5 billion dollars, the KWU reactor costs 50 percent more than the amount of the Canadian offer. Apparently this is the price the Argentines are willing to pay for the veil to be drawn over their atomic scenario.

In fact there are several indications that the Germans have resorted to shabby competition. Like schoolboys caught in the act, the people in Bonn at first moved away from the joint German-Canadian march route, declaring that the control agreement was "the Swiss' business."

The discretion with which ministries in Bonn are now handling the trouble with Canada is also rather a sign of painful embarrassment: of all things, a military dictatorship of the Argentine ilk is being given modern nuclear technology by the Germans at more favorable conditions than any competitors.

Again, as in the case of the Brazilian contract, Bonn is the scapegoat on the international scene. And probably not without justification, because after the controversial Brazilian deal so-called experts conferences about atomic dangers in the fuel cycle were established precisely for the discussion of such deals. For good reasons the Germans said nothing there about their Argentine deal.

Not only competitive envy by any means but also bitter experience has caused the anger of the Clark government about the devious German moves. In 1974 India ignited an atomic bomb which had been constructed in accordance with Canadian know-how. No wonder that the supplier now attaches importance to meticulous controls.

Meanwhile, the pressure from Ottawa has become so great that, at least in public, the Germans are showing a readiness to yield. In early November the nuclear cabinet postponed its vote, which really was due, about granting an export license for the reactor. First, negotiations are now to be started with the unwilling Argentines about new controls in order to rule out military abuse of the German or Swiss technology.

But it was not entirely of their own volition that the Germans listened to reason. The Canadians have already made it known in Bonn that they have means of pressure at their disposal.

An agreement under which Canada, one of the biggest uranium producers in the world, has supplied the EEC with nuclear fuel in the past couple of years will expire at the end of this year.

8790

CSO: 5100

FINLAND

PARLIAMENT DEBATES WASTE ISSUE IN AUSTRALIA TREATY

Helsinki HELSINGIN SANOMAT in Finnish 3 Oct 79 p 8

[Excerpt] With concern over the storing of radioactive waste accumulated from nuclear powerplants, Parliament is in the process of approving an agreement between Finland and Australia on the sale of uranium.

The proposed agreement was first subjected to debate on Tuesday, is to come up for a second debate session on Friday and will probably be approved following deliberation next week.

At issue is a basic agreement in terms of which the Finnish and Australian governments agree on those conditions under which commercial shipments of nuclear material may take place between the two countries.

Conclusion of the proposed agreement with Australia will enable Teollisuuden Voima Oy [Industrial Power Company] to be the first to have an opportunity to apply it for the purpose of setting up agreements for the procurement of new fuels.

At the present time the Teollisuuden Voima Oy has agreements with two Canadian firms for the delivery of raw uranium until 1983.

The most vehement criticism of the agreement has come from SMP [Finnish Rural Party] representatives, who moved for its rejection, appealing, among other reasons, to the fact that the problem of storing nuclear waste has not yet been completely resolved.

The SMP will probably at the most receive support from a few isolated representatives from other parliamentary groups.

Thus Aulis Juvela of the SKDL [Finnish People Democratic League] has announced his group's approval of the agreement. He, however, pointed out that it had voiced its reservations during the deliberations of the parliamentary Foreign Affairs Committee.

The committee assumed, among other things, that the agreement would include provisions for the handling of the operational waste produced by the nuclear

fuels in question, and for the solution of problems pertaining to their ultimate storage in a safe, permanent and consistent manner.

Debate Urgently Demanded

While the various representatives held the floor, the whole nuclear power issue was extensively passed over. So Liisa Jaaknosaari of the SDP [Social Democratic Party] urgently demanded that Parliament engage in a broad debate on the need for nuclear energy.

Terhi Nieminen-Makynen of the LKP [Liberal Party] said that the LKP parliamentary group is demanding that the government give Parliament an accounting of the situation in accordance with the act regulating parliamentary functions.

According to Nieminen-Makynen, Parliament is being forced into a decision whose consequences are unknown. She suspects: "It is felt and it seems that they want to shelve debate on what will be our biggest national issue, starting with the 1980's, in the future too."

Esko Almgren of the Christian League said that his party was prepared to demand a referendum on nuclear energy. "Since a referendum has been resorted to in order to resolve an important issue pertaining to our policy on alcoholic beverages, it is also perfectly possible to resort to the same procedure with regard to the nuclear energy issue," Almgren said.

Mikko Elo (SDP) accused opponents of nuclear power of being against economic growth.

11,466
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FINLAND

RADIATION SAFETY INSTITUTE: TWO NEW N-PLAN VIOLATIONS

Helsinki HUFVUDSTADSHLADET in Swedish 8 Nov 79 p 1

[Article by Tom Vuori]

[Text] Two new violations of the safety regulations of the Radiation Safety Institute have been discovered at the nuclear power plant at Olkiluoto. This appears from the second quarterly report of the institute which became ready last Wednesday. The report, moreover, mentions three incidents which could have become hazardous to the staff of the power plant.

The first violation of the safety regulations was due to a purely human error. Nuclear power plants are equipped with tanks with a boric acid solution in case the regulating rods of the reactor, by means of which the neutron activity is checked, should not function. In such a situation, the boric acid solution is pumped into the reactor to stop it.

The boric acid solution consists, for the most part, of water; at the Olkiluoto plant, the water is added to the tank manually. This is done in a locked room; the employee who was performing this task left the room, however, left the faucet running, and slammed the door behind him, only to discover that he had left the key on the other side.

Before they had found a spare key and got back into the room to close the faucet, nearly 4 cubic meters of excess water had run into the boric acid tank, and the boric acid concentration had dropped to 1 per cent. Only a couple of days later was the fault corrected, and during that entire period, the reactor had been running at full capacity.

The other violation of the safety regulations was considerably less dramatic. According to the regulations, for fire control reasons, the plant must be equipped with a tank containing 2,000 cubic meters of water for fire extinction in case of fire. Eight times during the second quarter did the water level of the tank drop to below the minimum level, the lowest point being to 1,400 cubic meters.

Overheating

However, in the judgment of the Radiation Safety Institute, a defect in the power plant which was discovered already in late March was of a considerably more dangerous nature. When, for some reason, the reactor has to be slowed down, the fuel rods are cooled down by means of water. In the event that the main pumps should not work, there is an auxiliary feeding system which feeds cooling water into the reactor. During an inspection it was discovered that this system did not function satisfactorily; the result of this, under unfortunate circumstances, could become overheating of the reactor. The dust hood of the fuel rods can then become damaged, with radioactive fallout as a result.

Overheating was risked on two other occasions, both times the heat effect from the reactor rose to 103.5 per cent, which, however, is not sufficient enough to release the automatic control devices for emergency cooling.

The second more serious defect which was discovered at Olkiluoto was that the lifting arm which inserts and removes the fuel rods had been incorrectly installed, the screws had not been sufficiently tightened, and the arm or the "loading mechanism" did not function. The risk here was that it could have lost its grip on the fuel rods during the transport to or from the reactor, causing them to drop down and become damaged. The consequence of that can also be radioactive fallout.

Unauthorized Exchange

As far as Lovisa I is concerned, the second quarterly report contains but two points of criticism, a regulating rod which did not function (that has happened before) and the unauthorized exchange of a measuring device filter. The latter is more serious and might have been described as a violation of the safety regulations.

For without reporting to or obtaining permission from the Radiation Safety Institute, the staff at Lovisa had changed the type of charcoal filter of the measuring devices which show how much radioactivity is found in the air that is emitted from the plant through a tall chimney. From the point of view of safety, these measuring devices are of vital importance to the nuclear power plant, and the Radiation Safety Institute says that the exchange may have affected the reliability of the measuring devices. What increased the annoyance of the Radiation Safety Institute at the unauthorized exchange was that a similar incident had been criticized on one earlier occasion. The institute, moreover, has made a special report on the incident and has urgently requested Imatran Voima to see to it that an event such as this does not happen in the future.

7262
CSO: 5100

FINLAND

BRIEFS

NUCLEAR PLANT FUELED--Turku (HS)--The fueling of the Industrial Power Company of Olkiluoto's second nuclear powerplant with uranium was begun Monday evening at 1916 hours, immediately after the Radiation Security Institute granted permission to do so. During the fueling phase 500 fuel bundles containing uranium are transferred to the reactor. The operation lasts a couple of weeks. The institute's technical nuclear test run begins during the charging phase. Before charging, the Radiation Security Institute made out the license to operate at the plant, with the understanding that there would be a final inspection, and then signed the permit to charge the reactor Monday evening. [Text] [Helsinki HELSINGIN SANOMAT in Finnish 2 Oct 79 p 20] 11466

CSO: 5100

NATION'S ENERGY POLICY REVIEWED BY CEA ADMINISTRATOR

Paris LE FIGARO in French 8 Sep 79 pp 7-8

[Article by Michel Pecqueur, CEA [French Atomic Energy Commission] administrator]

[Text] "The energy consumers sang for 20 years,"
"So they knew not what to do,"
"When the oil crisis came upon them."

Is this not a modern version of La Fontaine's fable? Has winter already come? What can the ants and cicadas do when they are closely linked in the same community?

The 1974 oil crisis was but a warning. At first, it gave rise to surprise, indignation and finally, some thought, but in the end, it was quickly forgotten. The drop in energy consumption in the world was due to the economic recession rather than any serious modification in habits of energy use.

Over the past 2 years, some persons have even begun to maintain that the risk of a future crisis was greatly exaggerated and that things would get much better. And yet, independently of the political upheavals that might occur at any time, numerous energy studies point to repeated situations of serious tension in the 1980's, rather than any single situation.

An energy crisis is undoubtedly not unavoidable, but it will only be prevented if truly determined policies are put into action throughout the world.

With some 65 percent of its energy supply depending on imported oil, France feels the full force of the successive price hikes. The most recent imports this year cost us some 30 billion francs, almost the total amount of Renault's exports, double the turnover of an enterprise such as Aerospatiale, the investment cost of ten nuclear powerplants or twice the annual EDF [French Electric (Power) Company] program.

Reducing this dependency is therefore an essential element of our economic and monetary balance and consequently, of the stability of living conditions in France. Our ambitious objective is to bring this rate of dependency on

foreign oil to 45 percent by 1985. The goal will be achieved only if we call upon all possibilities supplied to us by nature and technology, while taking into account their cost, specific uses, and their economic and environmental advantages and disadvantages.

We must first of all try to save on energy. Naturally, this cannot be done without investing and without an energy policy. For 1985, the government has set a conservation goal of the equivalent of 35 million tons of oil, corresponding to roughly three-fourths of the objective set for the nuclear program.

In addition, and insofar as import and consumption conditions permit, we must use coal resources to which we have access.

Finally, we must call upon all the resources of new types of energy, particularly the type of energy that is already available for massive industrial use: nuclear energy.

In addition, every time that a real and serious opportunity presents itself, we must use the contributions of the different types of unconventional energy (geothermic, solar, biomass energy, and so on), while making realistic estimates about their development possibilities, taking into account their cost, specific uses and the time needed for development.

In this diversified strategy, nuclear energy must play an important role, considering its own merits. In order to judge these, one has but to refer to the criteria to which it appears to be necessary to subject the different types of energy: cost, reliability of supply, impact on economic growth, employment and the balance of payments, public health and the environment.

Price Differences

Let us speak first of all about the cost.

Rather than instant estimates, let us look at their evolution in time. The table below traces the evolution of the cost of the nuclear kilowatt-hour over the past 8 years. The first element that strikes one's eyes is the extreme sensitivity to the price of fuel of a kilowatt-hour produced by coal or fuel (on the order of 2/3), while the cost of nuclear power varies little with the price of uranium (share of uranium on the order of 10 percent). The cost of the kilowatt-hour produced by coal and fuel is therefore particularly sensitive to future increases in the price of these raw materials.

For its part, the cost of the nuclear kilowatt-hour did experience a tangible shift between 1974 and 1979 due to an increase in investment costs of powerplants. However, the competitive margin remained very clear. Will this increase in the cost of nuclear investments continue, particularly under the pressure of new safety measures that will have to be taken after the Harrisburg accident? Possibly, but if such an increase exists, it should be much smaller because the powerplants are now well known and a

great deal has been done in the area of safety. Moreover, the investment costs for a coal or fuel powerplant are not exempt from increases either if one wants to reduce the harmful effects of their waste and be more in keeping with the nuclear powerplants.

On the whole, the economic advantage of nuclear energy has a good chance of growing due to increases in the price of oil and coal. On the basis of current figures, the gain in 1985 would be nearly 6 billion francs annually for France.

Two other equally important effects concern employment and the balance of payments: Some 90 percent of the cost of the nuclear kilowatt-hour is used to provide employment for French workers (for the construction of reactors or the operations of the fuel cycle). In the case of imported oil or coal, this proportion is much lower, which means that for a given amount of energy produced, a nuclear program creates or maintains many more jobs.

Production Cost of One Kilowatt-Hour¹

Year	1972	1973	1974	1975	1976	1977	1978	1979 ²
Fuel	3.96	4.5	8.2	10.8	11.5	13.3	17.6	20.4 (including 14.5 for oil)
Coal	5*	5*	8*	11*	11*	11.6	15.2	17.8 (including 11 for coal)
Nuclear	3.9	4.1	4.5	6.7	7.3	9.7	10.7	11.8 (including 1.5 for uranium)

1. In current centimes, according to the Advisory Committee for the Production of Electricity by Nuclear Means.

* Not cited by the Advisory Committee; estimates based on the cost of heat produced by coal.

2. Mid 1979 estimate.

Finally, by 1985, the French nuclear program will make it possible to reduce French oil imports by 45 million tons compared to what they would have been without it. This means that foreign exchange expenditures will be reduced by 28 billion francs (assuming that oil will cost \$20 per barrel and that the dollar will be worth 4.5 francs). This is more than the turnover of a company such as Pechiney Ugine Kuhlmann.

If one switches from oil to nuclear power, is there not a risk, with respect to natural uranium, of experiencing difficulties similar to those we have had with our oil supply?

Actually, the situation is very different:



In addition to the major uranium mines in France and Africa, the French enterprises, particularly COGEMA [General Nuclear Materials Company] (a subsidiary of the AEC), MINATOME [expansion unknown] (PUK [Pechiney Ugine Kuhlmann] and CFP [French Petroleum Company]) and IMETAL [expansion unknown], operate and prospect on all five continents, particularly in the United States, Canada, Australia, Latin America and the Far East.

World uranium reserves are much better distributed than oil reserves and a policy of diversification is possible.

The low portion of the kilowatt-hour constituted by the cost of uranium enables one to anticipate much larger stocks. Where it was financially possible to store only 3 months of oil, it is possible to store 18 months of uranium.

On its own soil, France has uranium reserves making it possible to supply between one-third and one-half of its own needs, well over two-thirds if one includes the franc zone. These reserves constitute the best guarantee for our supply.

Finally, the development of breeder reactors of the Superphenix type demand no additional natural uranium, which will make it possible to gain total independence.

Such neutral organizations as the World Health Organization recognize that the impact on the health of workers and populations is considerably smaller for the production of one nuclear kilowatt-hour than for one produced by fuel or coal. While the world experiment is already equivalent to the operation of 200 reactors for 10 years, no fatal accident has ever occurred in a nuclear powerplant. At the time of the serious Harrisburg accident, the safety devices and in particular, the wall built around the plant, made it possible to protect the workers and the population effectively. They suffered a negligible amount of radiation compared with the level of natural radioactivity. One must therefore be careful in deriving all possible lessons from the accident, but it did not affect the exceptional performance of this industry on the health level.

However, despite its advantages and despite the fact that we have no other reasonable choice, nuclear power will only be able to play the role it is capable of playing if the public approves of it, even with the aura of distrust surrounding it. Gradually, the man in the street must learn to evaluate the real extent of the nuclear risk and find it acceptable. It is up to us to make the necessary effort so that nuclear power will become more comprehensible and more familiar.

The cold, north wind has not yet come but it is already autumn. After the first storm of 1974, one can see heavy clouds building up. We do not know whether it will be an early or late winter, but we are sure that it will come, even if a few sunny days give the illusion of a new spring. The ant must therefore not relax its nuclear effort and forget to save on energy, while the cicada is content to sing, albeit a more melancholy song.

11,464
CSO: 5100

PORTUGAL

BRIEFS

URANIUM MINING--The mining of uranium should begin in Azere, Tabua county, in 1980. The uranium was discovered several years ago in that region but the mining for it was stopped shortly after the discovery was made. This radioactive mineral, the mining of which has been centered in the Urgeirca mines (Nelas), is present in relative abundance in the Azere region. It is calculated that the mining of the mineral in that locality of the district of Coimbra will last three years. A group from the Geology and Mines Services has undertaken studies there to evaluate the lode and to determine the work that must be done. [Text] [Porto 0 PRIMEIRO DE JANEIRO in Portuguese 11 Nov 79 p 8]

CSO: 5100

SWITZERLAND

CERN PLANNING GIANT ACCELERATOR FOR GENEVA

Brussels LE SOIR in French 21/22 Oct 79 p 5

[Article by Jacques Poncin: "High-Energy Physicists Would Like to Install New Giant Accelerator at Geneva"]

[Text] Over the next several months, the CERN (European Nuclear Research Center) member countries will have to study the files on a new and colossal investment project involving something like 18 billion Belgian francs, intended to give high-energy physicists a choice instrument in studying infinitely small components of matter. This machine, known by the abbreviation LEP [Large Electron-Positron] is in keeping with a science which will always need ever more gigantic and more powerful instruments, somehow in an inverse proportion to the object of study involved. This project has already produced some grinding of teeth and, although it is too early to start the debate in terms of the money suppliers—Switzerland will share in the CERN budget to the tune of 4.33 percent—it seems a good idea to us to place this question within its proper scientific context.

Until just a short time ago, scientists believed that matter was simply made up of atoms which is what they have been called since the times of the Greeks because that word means "something that cannot be divided." Physics during this century held this belief but was able quickly to establish that the atom in fact was in turn made up of a nucleus around which a cloud of electrons was gravitating and those electrons determined the body's chemical behavior; the nucleus was then broken up into protons and neutrons and the latter were to become famous because they are the moving elements not only in the atomic bomb but also in the nuclear electric reactor.

Twenty-Five Years of Research

The CERN sprang up 25 years ago at this state of the art. Its mission was to give Europe the instruments (entirely too expensive for each of the countries) that would be capable of smashing the protons and the neutrons. Research along these lines reached its high point after the fifties and physicists thereafter recorded the description of numerous particles whose behavior is more or less unique but whose real existence has also been demonstrated more or less. All of the work now consists in better detecting the properties of these particles in order to be able to regroup them in the form of families. Let us mention some ~~names~~ here purely by way of example: Leptons, hadrons, quarks, muons, pions, kaons, neutrinos, etc.

This latter particle is undoubtedly the most outstanding among all; it has no electrical charge, nor does it have any weight—or at least it has no measurable weight. Although myriads of neutrinos traverse our globe at any moment, they have never been discovered (although this word may not be quite proper here), except by deduction, and one cannot study them except through the results of their collision with less discreet particles. Here is another remark concerning these bodies: There is tremendous symmetry in nature and to each grain of matter corresponds as much antimatter, a kind of image reflected in a mirror provided with an [illegible word in photostat, inverse?] electrical charge: the proton has its antiproton, the electron has its positron, etc.

Here we have a rather numerous and quite flighty family whose diversity somehow has disappointed those physicists who are dreaming, like Einstein, of discovering a significant theory on the structure of matter. Their hopes however should not be disappointed because the unit perhaps cannot be the composition of matter but rather of forces which are set in motion within it.

The Low-Electric Force

So far we have described four forces: The electromagnetic force which is well known (including a magnet, an electrical current, etc.) and which is already the result of a theoretical unification accomplished by the physicist Maxwell, a strong interaction, 100 times stronger than the preceding one and responsible for the cohesion of the atomic nucleus (it is, if you will, a kind of glue, so that, in a highly imaginative fashion, the term gluon was applied to the quantum of energy moving it), the weak interaction which is behind radioactivity, and finally, the force of gravitation which keeps us on the ground and which, more fundamentally, regulates the arrangement of the entire universe.

These forces have a widely differing order of magnitude and it was generally believed that they would remain quite distinct in terms of theories until three contemporary scientists (Mr Glashow, Mr Weinberg, and Mr Salam

[illegible in photostat]) suggested a theory according to which the electromagnetic forces and the weak forces appear different to us only because our experiments place us under conditions where they are precisely different. If we work with the very highest energy we could, according to them, observe just one single interaction: The weak or low electric force. That of course is only a working assumption right now but, on certain points, there are beginning of an explanation for the theory which lead us to suspect strongly (by the way, it won the Nobel prize for its authors this year) the idea that it is correct and that we would like to have a clear understanding of. But for that we need some new tools—and, well, we got them!

From the Microscope to the Proton Supersynchrotron

The first instrument which improved our view of matter is the microscope. It enables us, without the supply of any special energy, to observe down to $1/100$ mm. Its big brother, the electron microscope, enables us to see things 1,000 times smaller but it requires an energy of 100 KeV. But that is not enough to pick up a subnuclear particle; we have to go down several zeroes into the scale of the infinitely small. We must thus develop a little trick. It is a little bit as if the paving stones were to escape our view and as if, in order to discover them, we would have to drop them in water and define their property merely by measuring the circles formed at the surface of the water.

Here, the stones are particles. We smash them violently against each other or against various targets. To do that, we have to accelerate them, we have to give them energy. We began with machines having a power of 100 MeV; they made it possible to study fragments of matter on the order of one-billionth of a millimeter. The most recent machines are 1,000 times more precise but here again this gain is paid for dearly in terms of energy; we need hundreds of trillions of electron-volts, in other words, GeV.

The most high-performance machine by the way is at the CERN in Meyrin, near Geneva, astride the French-Swiss border. This is the SPS (Proton Supersynchrotron) which is to reach 450 GeV, thus capping a whole series of instruments which would also include a 600-MeV synchro-cyclotron, a 28-GeV proton synchrotron, and intersection storage rings. Specifically, these particle accelerators are like rings in whose middle we find circulating intense magnetic packages accelerated by the application of radio waves. This is the accelerated movement which gives energy to the particles, a little bit like the hammer which the athlete whirls before letting go of it. After going through a certain number of revolutions in the accelerator, these particles are sent against targets or other particles and that creates an "event," that is to say, a production of new particles which we observe by means of different obstacles and especially electronic apparatuses.

All of these machines are enormous. The apparatus that was started in 1959 had a diameter of only 200 m and storage rings (1971) of 300 m; the SPS, which became operational in 1976, has a diameter of 2.2 km; this necessitated its underground construction using a technique closely related to the one employed in digging the tunnels for the subway.

This of course will give you only a small idea of what it involves because one must take into account everything there is up the line from the accelerator, in other words, the control apparatuses, and down the line, in other words, the experiments as such and the mathematical processing of their results. Here is an interesting figure: For a new experiment now being set up on the SPS, it was necessary to order no less than 1,000 microprocessors!

One might think that, now that they have the SPS, physicists are happy and have no further projects in mind. That is not the case. As a matter of fact, following in the footsteps of their American, Soviet, and even Chinese colleagues, they always have new irons to put into the fire. The current one is not really involved in the race for ever more energy to be imparted to the proton; but it is just the same a project of a size much more colossal than the SPS to the extent that the idea here is to accelerate particles with such feeble weights [masses] that you need an ever bigger ring.

"Cleaner" Experiments

This brings us to the famous LEP, an abbreviation which means Big Electron-Positron Ring. The final dimension of the process involves a diameter of about 10 km, a compromise arrived at between physicists who wanted more and engineers who were wondering already how they were going to keep a minuscule ribbon of particles perfectly horizontal over that distance.

In spite of its impressive dimensions, the LEP will not exceed 130 GeV. As a matter of fact, it is running parallel to the more traditional accelerators. It should permit "cleaner" experiments, that is to say, experiments involving less secondary particles, and that would give us a more reliable reading of the results. Under these conditions, it should be possible better to detect new particles and to check out the famous unifying theory on weak and electromagnetic forces. That will tell us, somehow, whether the decision of the jury was correct in awarding the Nobel prize.

This project, as we said, has already raised some questions. First of all, because of its gigantic size and its cost (18 billion Belgian francs for the first phase and 4 billion in a subsequent phase). Here is another question: Will the Europeans allow themselves to be swept away in "American-style" spiral? In other words, must we necessarily follow suit

simply because the physicists beyond the Atlantic have just started construction on two accelerators of the new generation.

Voracious Energy

As a matter of fact, this brings up the entire problem of acceptability by the public at large when it comes to funds allocated for pure research. During times of crisis, people are not against the idea of letting other countries do the most expensive research.

This is a dangerous line of reasoning according to the Belgian Leon Van Hove, director-general of research at CERN: "We, Europeans, must remain in the field of basic research because someday very soon it will lead to a concrete application and we have to be among the first to derive benefit from that!"

Here is another type of complaint expressed especially by the Swiss Energy Foundation: Is it normal, that at the moment when the authorities are asking the people to reduce their energy consumption, one should build a machine whose electric power will definitely be more than 100 Mw, whereas the CERN already at this time consumes as much as half of the entire Geneva metropolitan area. Without being able to deny that there is indeed something to this argument, physicists pointed out that the LEP would cause certain current installations to fall into disuse and that the total laboratory consumption in the end would increase "only" by 30 percent, although in 1989, the presumed date for starting the LEP, the CERN would "only" consume 42 percent of the consumption in the Geneva metropolitan area, assuming that the latter's consumption grows 2.5 percent each year.

We shall be careful not to cut this debate off. The question certainly merits being asked.

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ELECTRICITY BOTTLENECK, NUCLEAR POWER PLANTS DISCUSSED

Istanbul MILLIYET in Turkish 25 Oct 79 p 2

[Article by Prof. Nejat Aybers, Istanbul Technical University Nuclear Energy Institute Director]

[Text] In the utilization of nuclear energy, Turkey has lagged behind many other developing countries which have the same potential as Turkey. For Turkey to make progress in this technology is possible only with the establishment of a nuclear power plant.

The scientific work carried out by such institutions as the universities and the A&K [Atomic Energy Commission], as long as it is not based on real needs, just remains in the air, and difficulties in finding students, researchers, and funding put a brake on even these efforts.

Even though efforts carried out since 1965 have reached the final stage, opposition is developing for various reasons to the building of a nuclear power plant in Turkey.

Electricity: How Much Is Necessary?

The discussion of whether or not nuclear energy is necessary for Turkey is related to the planning of energy needs. Those who oppose nuclear energy, proceeding from this point, are able to say that, while the energy shortage is a reality today, Turkey has no need for so much energy production. As the rationale for this assertion, it is claimed that 75 percent of the electricity generated is used in industry, and that a large portion of this is utilized in the production of consumer and intermediate goods.

To make a distinction between those branches of industry which produce consumer goods and those which produce capital goods may be considered for a temporary period and in a rather artificial way. Yet an industry which produces capital goods — for instance, machine tools — will eventually sell its products to an industrial concern which produces consumer goods. In the final analysis,

every sort of industry is established to produce goods for which either the public or the state have a need.

In 1976, the average per capita consumption of electricity in Turkey was 450 kilowatt-hours, while the figure for neighboring Bulgaria was 2,700 kilowatt-hours per person.

It is inconceivable for the Turkish people not to want to benefit just as much as their neighbors from the convenience afforded by electricity. Moreover, it is the wish of every patriotic citizen to see the benefits of this resource distributed throughout the population and extended all the way to the peasants. This debate then concerns not the restriction of the need for electrical energy, but rather the proper management of its consumption.

Generally, the average power and energy requirement model for the next few years, upon which there is general agreement, can be evaluated as follows:

- For the year 1982: 7,040 MW [Megawatts] and 39,500 Gwh [Gigawatt-hours]
- For 1987: 12,560 MW and 70,400 Gwh
- For 1992: 20,870 MW and 117,000 Gwh
- For 1997: 32,620 MW and 182,900 Gwh

To work to supply these needs from domestic sources is an indisputable necessity.

At the end of this process of development, the amount of electrical energy will be 2,650 kwh per capita; that is, an amount equal to the figure for Bulgaria in 1976.

Turkey's solid fossil fuel potential is classified under lignite and bituminous schists, and it is theorized that she has an additional 4,100 MW capacity from lignite and an 850 MW capacity from bituminous schist.¹ If all this capacity can be exploited, then there exists the possibility of producing an additional 30 billion kwh of energy yearly by means of coal.

As For Water...

As for Turkey's hydroelectric potential, it is grouped within 26 river basins, and it is put forth as 26.016 MW, or else 100 billion kwh per year. In a study carried out by the OECD, Turkey's theoretical hydroelectric potential was given as 430 billion kwh per year, and, on the assumption that 15 percent of this potential could actually be utilized as electricity, Turkey's economic hydroelectric potential was given as 65 billion kwh per year. Both the 430 billion kwh calculated from the snow and rainfall figures and the 100 billion kwh now assumed cannot be true simultaneously, since it would be impossible to convert into electricity a full quarter of all the water which falls to the earth.

Even if Turkey's hydroelectricity potential is taken as 100 billion kwh, since no nation in the world can utilize all its hydroelectric potential, Turkey will in the future be able to produce only 60 to 70 billion kwh per year from this potential.

When the requirements of 1997 (that is, 183 billion kwh per year) are compared with these resources, it becomes clear that Turkey does not possess sufficient hydroelectric potential to meet its requirements. In such a situation, the Akkuyu Nuclear Power Plant, which will begin operation in 1987, will turn out to be a step taken just in time.

Drawbacks, But...

Every technology has both positive aspects and drawbacks. For instance, in addition to the positive benefits of the chemicals industry, its negative environmental effects are a topic of worldwide debate. As the drawbacks to nuclear energy, one can point to the danger of radiation, the dependency on foreign sources, and its great expense.

When one looks at the number of nuclear power plants built in Europe's most populous countries, it is clear that the dangers have been exaggerated.² The Harrisburg accident which took place in 1979 in the United States corroborates this. In this major accident, which has distracted the world for months, no one was harmed at all, including the operating personnel.

However, there is a necessity that licensing procedures and quality maintenance procedures be well managed, so that nuclear power plants are constructed and operated in a safe and secure manner. In the event that the managers realize this necessity and do not begrudge instituting a number of safety measures, which incidentally do not entail great expense, success can be achieved in the matter of safety even in spite of a limited labor force.

It is a fact that, initially, nuclear technology relies on foreign sources. In the debate on this topic, it is first of all worth noting that this technology is no longer a monopoly of the U.S. There are a number of possibilities for reducing to a minimum the foreign dependence which arises in obtaining supplies of nuclear fuel. Long-term agreements could be made with such nations as France, England, Italy, and Soviet Russia, apart from the U.S., for an "enrichment service" for Turkey's own uranium.

By entering early into nuclear technology and favoring reactor types which operate on natural uranium, as well as other such measures, a number of nations such as India, Pakistan, and Argentina have been able to keep this technology from being dependent on foreign sources.

It is quite true that the initial costs are high, but it is also observed that this matter has not been well considered.

How Much?

On the assumption that the 625 MW Akkuyu Power Plant will be built for 30 billion TL, the unit installation cost is 48,000 TL per kilowatt. It is said that the 1,560 MW capacity first generator group of the Afsin-Elbistan lignite power plant, for which the awarding of the contract is in process, will cost 31 billion TL. In this case, only two thermal power plants could be built in place of one nuclear plant. And the amounts of foreign exchange required for these two types are not very different. Because the expenditure on fuel (20 tons of uranium per year) for a nuclear reactor is at least six times cheaper, it is quite comparable to lignite power plants from the standpoint of the cost of the energy produced. Here it is necessary to admit this one fact, however: the fuel costs of the first nuclear plant will be obtained by means of foreign exchange.

Everyone knows that hydroelectric generating plants are the type of power plant requiring the greatest investment. In addition to the cost of the dam, the lost production from the land flooded by the water behind the dam must be added to the figures in making the economic comparison. But it is also true that, not only have hydroelectric generating plants no fuel costs, but their foreign exchange requirements for construction are also quite low.

In this situation, it is clear that, for Turkey, hydroelectric power plants and coal-operated power plants have priority. However, nuclear generating plants are being proposed as a substitute for fuel-oil-operated power plants. Today, the initial cost of a fuel-oil-operated generating plant with a capacity of 600 MW can be as high as 15,000 TL per kilowatt. And since the cost of fuel each year, which can only be obtained with foreign exchange, is at least ten times higher than that of a nuclear power plant, nuclear plants could be more profitable from the standpoint of actual energy cost. It is hypothesized according to current information that the cost of energy produced in a 625-MW nuclear power plant would be 1.8 TL.

Construction of the Akkuyu Power Plant will not be an impediment to the construction of other power plants relying on domestic resources, for the financing for the Akkuyu Power Plant has been obtained from Sweden.

The credit for the Afsin-Elbistan project will be provided by the World Bank, the European Investment Bank, and from West Germany through the KfW [expansion unknown]. These two separate credit agreements do not affect each other in any way. The group which is establishing the Akkuyu Power Plant is the TEK [Turkish Electrical Power Enterprise Directorate General] Nuclear Power Plants Division, which is made up of personnel of various capacities; it will thus not affect the other project from the standpoint of staff, either.

For Tomorrow...

It is thus seen that, despite their drawbacks, nuclear power plants are practical. In fact, a power plant could not be included in the state plan without a "feasibility study" being done.

Right now, the Akkuyu Power Plant, the contract for which is currently being worked out, is Turkey's last chance to join the nuclear caravan. If this

effort ends in failure, the project will be postponed another 10 to 15 years. Since fast reactors will begin to be used in the years after 1995, building thermal reactors will no longer be of interest. Thermal reactors produce the fuel consumed by the newly developing fast reactors. In this situation, Turkey's entering into the field with the fast reactor will come to be an impossibility due to her not having plutonium and her not being developed from the technical standpoint.

It is certainly normal for there to be debate over whether a newly built and expensive power plant is beneficial or not. But it is much more important not to lose sight of the fact that a nation may end up deprived of a new technology.

FOOTNOTES

1. S. Kiciman, "Combined Heat-Energy Generating Plants and Energy Efficiency," Third Turkish General Energy Congress.
2. N. Aybers, "Effects of Nuclear Power Plants on the Environment and Public Health," Third Turkish General Energy Congress, 20-23 November 1978, Ankara.

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